

# ISO Analyze™ Software User Guide

Model 023-03



**SUN NUCLEAR**  
A MIRION MEDICAL COMPANY

# ISO Analyze™ Software User Guide

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# 1 Introduction

## Hardware Requirements

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The minimum hardware requirements for the ISO Analyze™ Software workstation are as follows:

- High resolution 19" monitor
- Keyboard and mouse
- Central processing unit with:
  - Core Duo (Dual Core) processor
  - 1 GB of memory
  - ATI or NVIDIA 256 MB graphics adapter
  - 160 GB hard disk

## Software Requirements

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The software configuration of the ISO Analyze Software workstation includes:

- Microsoft® Windows XP Pro SP2 or later
- Internet Explorer



**Note:** The software and hardware requirements are provided for documentation and are subject to change without notice.

## Description

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ISO Analyze Software is an integrated solution that enables the isocenter quality assurance of your linac by analyzing DICOM images acquired with the EPID detector and OBI system (CBCT). Controls are run automatically, analyzing CIRS ISO Phantom images and quantifying a large number of evaluation parameters. ISO Analyze Software allows report generation for each tested isocenter (collimator, gantry, couch, MV radiation, 2DkV, CBCT) as well as MV and kV pixel size.



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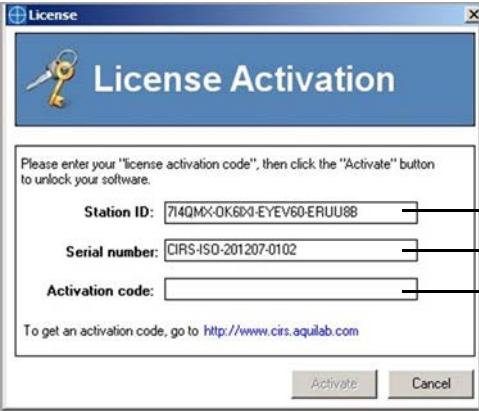
**WARNING: ISO Analyze Software is designed to check consistency of equipment performance and cannot be used for acceptance or commission of equipment.**

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## License

---

During startup, the ISO Analyze Software prompts the user to activate the license using the dialog shown below.



The image shows a 'License Activation' dialog box with a blue header and a key icon. It contains three input fields: 'Station ID' (pre-filled with '714QMX-OK6D4-EYEV60-ERUU88'), 'Serial number' (pre-filled with 'CIRS-ISO-201207-0102'), and 'Activation code' (empty). Below the fields is a URL: 'To get an activation code, go to <http://www.cirs.aquilab.com>'. At the bottom are 'Activate' and 'Cancel' buttons. Three arrows point from text on the right to the input fields: 'Automatically filled (generated by ISO Analyze installation; PC specific)' points to Station ID, 'Displayed on USB key label and in "Getting Started" text file on the USB key' points to Serial number, and 'Obtained from AQUILAB website, during registration setup' points to Activation code.

License Activation

Please enter your "license activation code", then click the "Activate" button to unlock your software.

Station ID: 714QMX-OK6D4-EYEV60-ERUU88

Serial number: CIRS-ISO-201207-0102

Activation code:

To get an activation code, go to <http://www.cirs.aquilab.com>

Activate Cancel

Automatically filled (generated by ISO Analyze installation; PC specific)

Displayed on USB key label and in "Getting Started" text file on the USB key

Obtained from AQUILAB website, during registration setup

Figure 1-1. License Activation Dialog

- Verify that the Station ID has been automatically filled in on the Activation window.
- Enter the **Serial number** (displayed on the USB key label and contained in the "Getting Started" text file on the USB key).
- Click **Generate Activation Code**.
- Enter the **Activation code** and click **Activate**.



**Note:** To obtain an activation code, go to [www.cirs.aquilab.com](http://www.cirs.aquilab.com) and follow the instructions on the License Activation window.

# 2 Image Acquisition

## Introduction

Image acquisition for complete accelerator isocenter quality assurance requires two test-objects:

- CIRS Daily ISO Phantom (Model 023)
- CIRS ISO Base™ (023-04) support platform for ISO Phantom (necessary when MV & kV pixel sizes are to be computed)

The image acquisition sequence proposed in this document is provided for information only and may be adjusted by the user. However, once the acquisition sequence has been established, the user should perform acquisitions in compliance with this sequence or run the risk of being unable to perform automatic mode analysis from a predefined protocol.



**Note:** The angular positions of the moving parts of the accelerator (collimator (a), gantry (b), and treatment table (c)) mentioned in this document comply with the names and directives of international standard IEC 61217. All ISO Analyze results are calculated in the IEC 61217 Coordinate System.

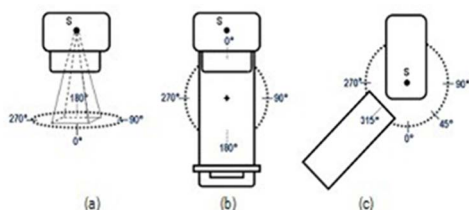


Figure 2-1. Angular Positions of Accelerator

### CIRS Daily ISO Phantom Without ISO Base

Position the CIRS ISO Phantom test-object directly on the patient table. Adjust the table height to bring the laser alignment marks on either side of the cube onto the side lasers of the accelerator. Adjust the positioning of the table top to bring the laser alignment marks onto the sagittal laser and the transverse laser. Check the general positioning of the test-object and refine the adjustments as needed.



Figure 2-2. Daily ISO Phantom Without ISO Base

### CIRS Daily ISO Phantom With ISO Base

Position the CIRS ISO Phantom on the ISO Base. Then, position the ISO Base on the patient table and adjust the table height to bring the laser alignment marks on either side of the cube onto the side lasers of the accelerator. Adjust the positioning of the table top to bring the laser alignment marks onto the sagittal laser and the transverse laser. Check the general positioning of the test-object and refine the adjustments as needed.



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**WARNING: Do not move or touch the test-object once initial positioning is complete. This positioning step is critical to obtain optimal results.**

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**WARNING: In order to ensure accurate calculation of MV and kV pixel size, it is imperative that the ISO Phantom rests against the bottom face of the pocket that is machined in the center of the ISO Base.**

---

## Acquisition

### Pixel Size of the MV Detector (Requires 023-04)

The MV pixel size is computed from one (1) image. A field size of 10x10 cm is advisable. Due to the distance between pixel size markers in the CIRS ISO Base, the field size cannot be smaller than 9.6x9.6 cm to compute this parameter.



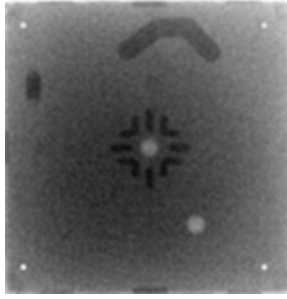


Figure 2-3. Typical image of CIRS ISO Base with CIRS ISO Phantom from MV Detector



**Note:** To compute the Pixel size of the MV detector parameter, the CIRS ISO Phantom must be positioned on the CIRS ISO Base.

### Pixel Size of the kV Detector (Requires 023-04)

Keep the test-object CIRS ISO Phantom in the same position used for the previous parameter. A 90° gantry rotation is executed to position the XR source above the test-object. An image is acquired from the kV detector without any collimation of the XR beam.

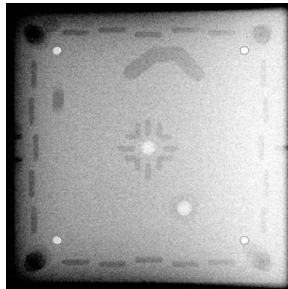


Figure 2-4. Typical image of CIRS ISO Base with CIRS ISO Phantom from kV detector



**Note:** To compute the Pixel size of the kV detector parameter, the CIRS ISO Phantom must be positioned on the CIRS ISO Base

### Collimator Rotation Isocenter

The collimator rotation isocenter is computed with either 4 or 8 images corresponding to various collimator positions. A field size of 10x10 cm is advisable. The following tables describe three possible acquisition sequences:

### Acquisition Sequence #1: 4 Images

Table 2-1. Configuration of acquisition sequence #1

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #1	0	0	0
Image #2	0	90	0
Image #3	0	180	0
Image #4	0	270	0

### Acquisition Sequence #2: 4 Images

Table 2-2. Configuration of acquisition sequence #2

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #1	0	45	0
Image #2	0	135	0
Image #3	0	225	0
Image #4	0	315	0

### Acquisition Sequence #3: 8 Images

Table 2-3. Configuration of acquisition sequence #3

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #1	0	0	0
Image #2	0	45	0
Image #3	0	90	0
Image #4	0	135	0
Image #5	0	180	0
Image #6	0	225	0
Image #7	0	270	0
Image #8	0	315	0



**Note:** The Gantry Position corresponds to the position of the MV source.

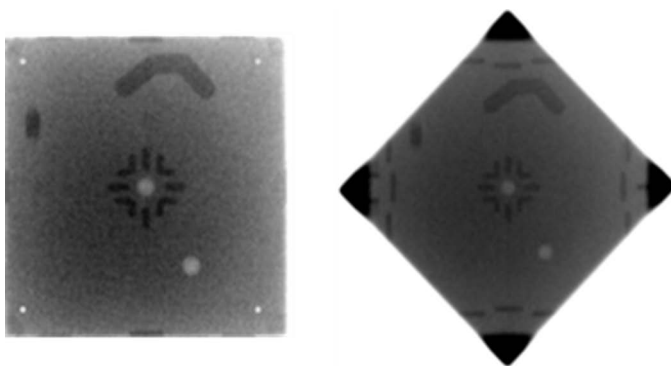


Figure 2-5. Typical images of CIRS ISO Phantom for Collimator rotation isocenter parameter

## Gantry Rotation Isocenter

The gantry rotation isocenter is computed with either 4 or 8 images (3 acquisition sequences) corresponding to various gantry and collimator positions. A field size of 10x10 cm is advisable. The following tables describe three possible acquisition sequences:

### Acquisition Sequence #1: 4 Images

Table 2-4. Configuration of acquisition sequence #1

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #1	0	0	0
Image #2	90	0	0
Image #3	180	0	0
Image #4	270	0	0

### Acquisition Sequence #2: 8 Images

Table 2-5. Configuration of acquisition sequence #2

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #1	0	0	0
Image #2	0	180	0
Image #3	90	0	0
Image #4	90	180	0
Image #5	180	0	0
Image #6	180	180	0
Image #7	270	0	0
Image #8	270	180	0

### Acquisition Sequence #3: 8 Images

Table 2-6. Configuration of acquisition sequence #3

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #1	0	90	0
Image #2	0	270	0
Image #3	90	90	0
Image #4	90	270	0
Image #5	180	90	0
Image #6	180	270	0
Image #7	270	90	0
Image #8	270	270	0



**Note:** The Gantry Position corresponds to the position of the MV source.

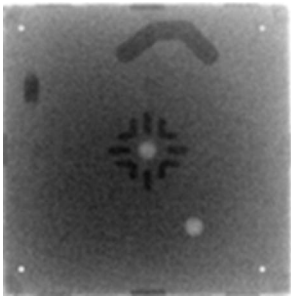


Figure 2-6. Typical image of CIRS ISO Phantom for Gantry rotation isocenter parameter

### Couch Rotation Isocenter

The couch rotation isocenter is computed with either 3 or 5 images corresponding to various couch positions. A field size of 10x10 cm is advisable. The following tables describe two possible acquisition sequences:

### Acquisition Sequence #1: 3 Images

Table 2-7. Configuration of acquisition sequence #1

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #1	0	0	270
Image #2	0	0	0
Image #3	0	0	90

## Acquisition Sequence #2: 5 Images

Table 2-8. Configuration of acquisition sequence #2

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #1	0	0	270
Image #2	0	0	315
Image #3	0	0	0
Image #4	0	0	45
Image #5	0	0	90



**Note:** The Gantry Position corresponds to the position of the MV source.

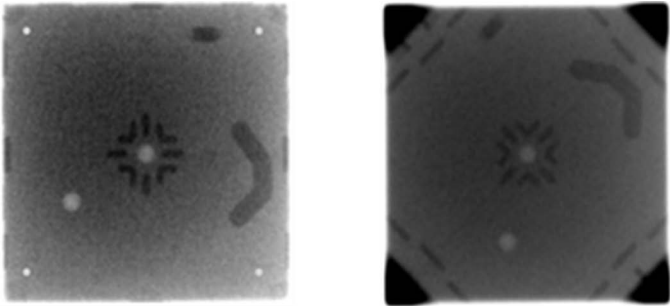


Figure 2-7. Typical images of CIRS ISO Phantom for Couch rotation isocenter parameter

## MV Radiation Isocenter

The MV radiation isocenter of the accelerator is computed with 8 images corresponding to various gantry and collimator positions. A field size of 10x10 cm is advisable. The following table describes two possible acquisition sequence:



**Note:** Images used for sequences #2 and #3 of the Gantry rotation isocenter parameter can also be used to compute the MV radiation isocenter parameter. In this case, the user will not need to acquire images detailed below.

## Acquisition Sequence #1: 8 Images

Table 2-9. Configuration of acquisition sequence #1

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #1	0	0	0
Image #2	0	180	0
Image #3	90	0	0
Image #4	90	180	0
Image #5	180	0	0

Table 2-9. Configuration of acquisition sequence #1 (Continued)

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #6	180	180	0
Image #7	270	0	0
Image #8	270	180	0

## Acquisition Sequence #2: 8 Images

Table 2-10. Configuration of acquisition sequence #2

Image	Gantry Position (°)	Collimator Position (°)	Table Position (°)
Image #1	0	90	0
Image #2	0	270	0
Image #3	90	90	0
Image #4	90	270	0
Image #5	180	90	0
Image #6	180	270	0
Image #7	270	90	0
Image #8	270	270	0



**Note:** The Gantry Position corresponds to the position of the MV source.

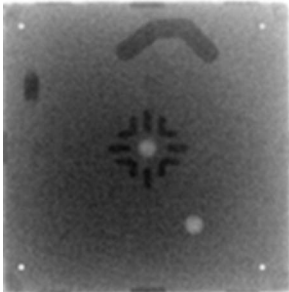


Figure 2-8. Typical image of CIRS ISO Phantom for “MV radiation isocenter” parameter

## 2DkV Isocenter

The 2DkV isocenter is computed with 4 images corresponding to 4 gantry positions. No collimation of the XR beam is necessary. Therefore, the following table describes the only possible acquisition sequence:

Table 2-11. Configuration of acquisition sequence

Image	kV Source Position (°)	Table Position (°)
Image #1	0	0
Image #2	90	0
Image #3	180	0
Image #4	270	0

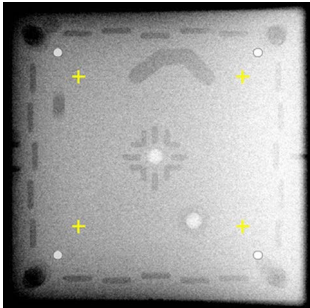


Figure 2-9. Typical image of CIRS ISO Phantom for 2DkV isocenter parameter

### kV-CBCT Isocenter

The kV-CBCT isocenter is computed from an acquisition in CBCT mode, with a gantry rotation of 360° and the table at 0°. The acquisition conditions are those used in the routine clinical protocol.

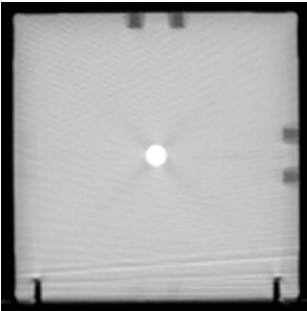


Figure 2-10. Typical image of CIRS ISO Phantom for kV-CBCT isocenter parameter

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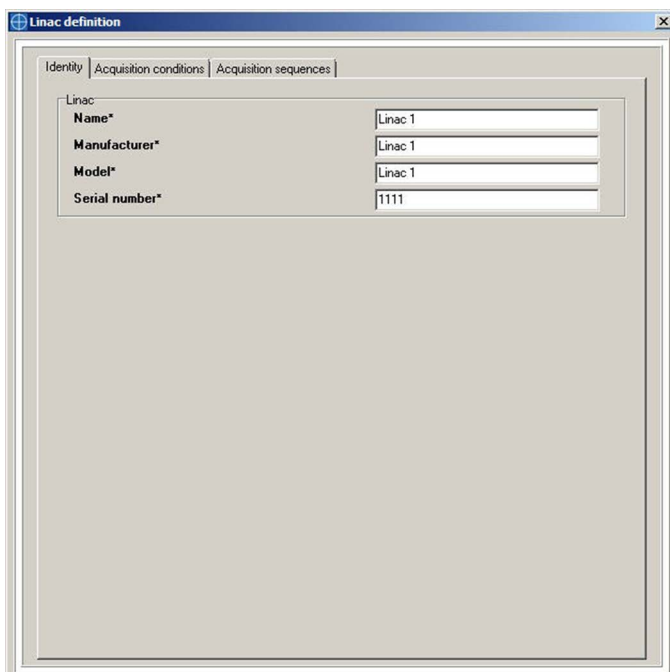
## 3 Linac Management Menu

### Add Linac

---

By clicking **Add linac**, the Linac definition dialog shown below appears. This dialog consists of three tabs. Each of these definitions are used for image analysis and report generation:

- Identity
- Acquisition conditions
- Acquisition sequences



The screenshot shows a window titled "Linac definition" with three tabs: "Identity", "Acquisition conditions", and "Acquisition sequences". The "Identity" tab is selected. Inside the tab, there is a section labeled "Linac" containing four fields: "Name\*", "Manufacturer\*", "Model\*", and "Serial number\*". The "Name" field contains "Linac 1", the "Manufacturer" field contains "Linac 1", the "Model" field contains "Linac 1", and the "Serial number" field contains "1111".

Figure 3-1. Linac Definition Dialog, Identity Tab

### Identity

Four fields are mandatory to create the device:

- Name
- Manufacturer
- Model
- Serial number



**Note:** These fields will be displayed on each report control.

## Acquisition Conditions

Linac definition: Linac 1

Identity | Acquisition conditions | Acquisition sequences

**DICOM Image**

**Modality** ☒ RTImage ☐ CR

**Irradiated areas** ☒ Black ☐ White

**Pixel size saved in DICOM** ☒ Detector ☐ Isocenter

**Images/Parameters association type** RT Image Label

**2DMV images acquisition setting**

**Field size in X at isocenter (mm)\*** 100

**Field size in Y at isocenter (mm)\*** 100

**Detector-X size (mm)\*** 300

**Detector-Y size (mm)\*** 300

**Source Axis Distance (mm)\*** 1000 ± 2

**Source Image Distance (mm)\*** 1500 ± 2

**2DKV images acquisition setting**

**Detector-X size (mm)\*** 300

**Detector-Y size (mm)\*** 300

**Source Axis Distance (mm)\*** 1000 ± 2

**Source Image Distance (mm)\*** 1500 ± 2

**Acquisition conditions**

☒ **Check the acquisition conditions**

*Comparison of conditions for acquiring images with DICOM tags "Gantry-Angle", "Beam Limiting Device Angle" and "Patient Support Angle".*

**Angle tolerance (°):** 0.2

**Phantom information**

**Central marker type** Ceramic marker

**Phantom serial number** xxx

Validate Cancel

Figure 3-2. Linac Definition Dialog, Acquisition Conditions Tab

## DICOM Images

- **Modality:** Two DICOM modalities are supported by ISO Analyze:
  - RT Image
  - CR
- **Irradiation areas:** Gray level of the irradiation areas in the images. There are two choices:
  - *Black:* Elekta and Varian Portal device
  - *White:* Siemens Portal device

- **Pixel size saved in DICOM:** Specify if the pixel size saved in the DICOM header is given at the isocenter or at the detector. By default, the pixel size is given at the detector (following the DICOM standard).

**Note:**



- According to the DICOM standard, the pixel size stored in the header of the DICOM RT Image [tag (3002,0012) Image Plane Pixel Spacing] is given at the detector [at the value in the tag (3002,0026) RT Image SID]. Some manufacturers do not comply with this standard and the pixel sized stored in the header is given at isocenter [at the value in the tag (3002,0022) Radiation Machine SAD].
- If the modality of images is set to “CR,” then the Pixel size saved in DICOM option is not available.



**WARNING: It is very important that the Pixel size saved in DICOM option is selected correctly. Selecting the wrong option for this info will lead to improper image segmentation as shown below.**

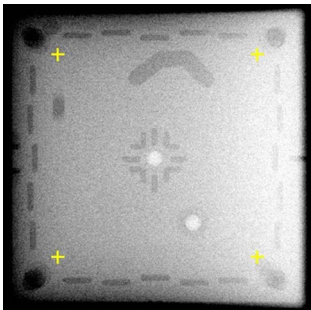


Figure 3-3. Pixel size saved in DICOM option selected correctly

Identity | Acquisition conditions | Acquisition sequences |

DICOM Image

**Modality** ☒ RTImage ☐ CR

**Irradiated areas** ☒ Black ☐ White

**Pixel size saved in DICOM** ☐ Detector ☒ Isocenter

**Images/Parameters association type** RT Image Label

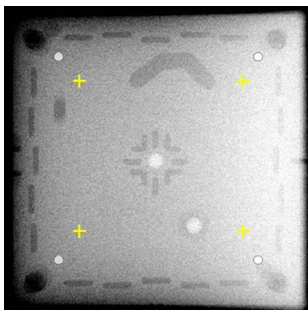


Figure 3-4. Pixel size saved in DICOM option selected incorrectly



**Note:** If the user is presented with improper image segmentation, the Pixel size saved in DICOM option may be selected incorrectly in the Acquisition conditions tab of the Linac definition dialog. Review this option selection and click **Validate** for a new computation of the results.

- **Images/Parameters association type:** Selection of the DICOM field used to sort images in the lightbox and consequently the image-parameter association during the loading of the images. There are two choices:
  - Acquisition order
  - RT Image Label



**Note:** If CR images are used, the Images/Parameters association type selection is "Acquisition order."

## 2DMV Images Acquisition Setting

- **Field size in X at isocenter (mm):** Field size used in X direction (collimation) for the images acquisition.
- **Field size in Y at isocenter (mm):** Field size used in Y direction (collimation) for the images acquisition.



**Note:** As a reminder, field sizes between 5 cm x 5 cm and 11 cm x 11 cm (between 9.6 cm x 9.6 cm and 11 cm x 11 cm if MV Pixel size is to be calculated) should be set up for image acquisitions. A linac cannot be validated with a field size outside of the 5 cm x 5 cm to 11 cm x 11 cm range.

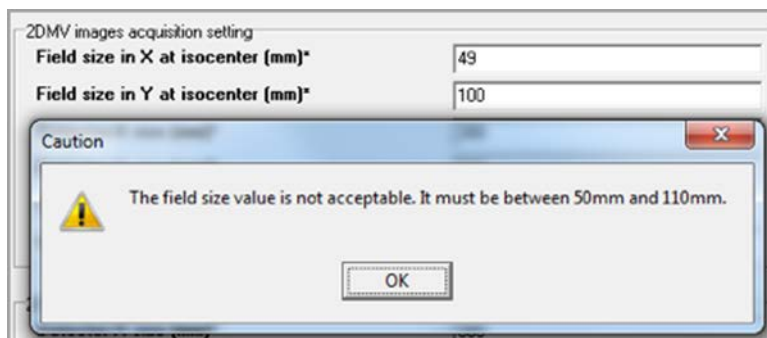
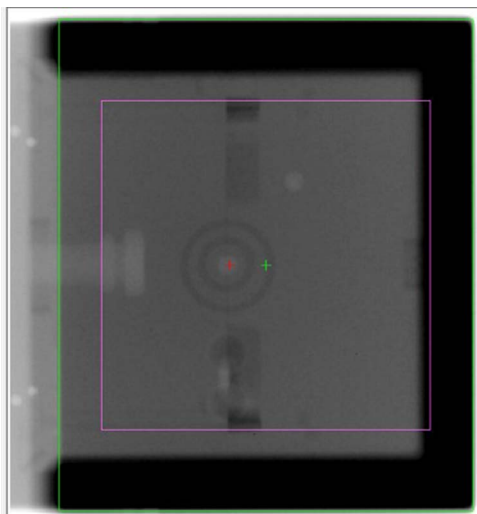


Figure 3-5. Error message regarding field size value outside of recommended range



**Note:** If images were acquired with a field size larger than 11 cm x 11 cm, there might be cases when the detected radiated field is different from what is being actually radiated due to sudden changes in values of pixels in the images being analyzed as shown in Figure 3-6. In such cases, which are also associated with large differences between the center of the ISO Phantom and the center of the radiated field, it is advisable that a new set of images with a proper field size is acquired and analyzed.



*Figure 3-6. Improper detection of radiation field due to interface of ISO Phantom and ISO Base introduces steep gradient in values of pixels from left side of image.*

- **Detector-X size (mm):** Physical dimension X of the detector. This information is required to determine the theoretical pixel size at SAD when it is not given or present in the header of DICOM images. If the pixel size is present and filled in the header of RT Image, or CR images are analyzed, then this information is not taken into account.
- **Detector-Y size (mm):** Physical dimension Y of the detector. This information is required to determine the theoretical pixel size at SAD when it is not given or present in the header of DICOM images. If the pixel size is present and filled in the header of RT Image, or CR images are analyzed, then this information is not taken into account.
- **Source Axis Distance (mm):** Specify the distance and its tolerance between the MV source and the MV Axis of the device. The value entered is compared to the value entered in the tag (3002.0022) in the header of DICOM RT Image. If the tag is not present or specified, then the value entered by the user is taken into account for the calculation of various parameters. For CR images, the value entered by the user is taken into account for the calculation of various parameters.
- **Source Image Distance (mm):** Specify the distance and its tolerance between the MV source and the MV detector of the device. The value entered is compared to the value entered in the tag (3002.0026) in the header of DICOM RT Image modality images. If the tag is not present or specified, then the value entered by the user is taken into account for the calculation of various parameters. For DICOM images modality CR, the value entered by the user is taken into account for the calculation of various parameters.

## 2DkV Images Acquisition Setting

- **Detector-X size (mm):** Physical dimension X of the detector. This information is required to determine the theoretical pixel size at SAD when it is not given or present in the header of DICOM images. If the pixel size is present and filled in the header of RT Image, or CR images are analyzed, then this information is not taken into account.
- **Detector-Y size (mm):** Physical dimension Y of the detector. This information is required to determine the theoretical pixel size at SAD when it is not given or present in the header of DICOM images. If the pixel size is present and filled in the header of RT Image, or CR images are analyzed, then this information is not taken into account.
- **Source Image Distance (mm):** Specify the distance and its tolerance between the kV source and the kV detector of the device.

## Acquisition Conditions

- **Check the acquisition conditions:** Verify that the gantry, collimator, and couch angles from the DICOM header of each image correspond to the selected acquisition conditions.



**Note:** Before activating this option, be sure that these values are encoded in the DICOM header.

- **Angle tolerance:** Tolerance between angles from the DICOM header of the images to analyze and those in the queue by the selected acquisition sequences.

### **Note:**

- If the Coordinate System of the linac to be analyzed is different from international standard IEC 61217, it is advisable that the user clears the Check the acquisition conditions checkbox and acknowledges the warning message in order to validate the linac as shown in Figure 3-7.
- A Coordinate System of the linac to be analyzed different from international standard IEC 61217 and a selected Check the acquisition conditions checkbox will lead to the software algorithm failing to analyze the images. A more burdensome fix in this case is for the user to use a DICOM editor to edit the DICOM tags related to angles in such a way as to match international standard IEC 61217.



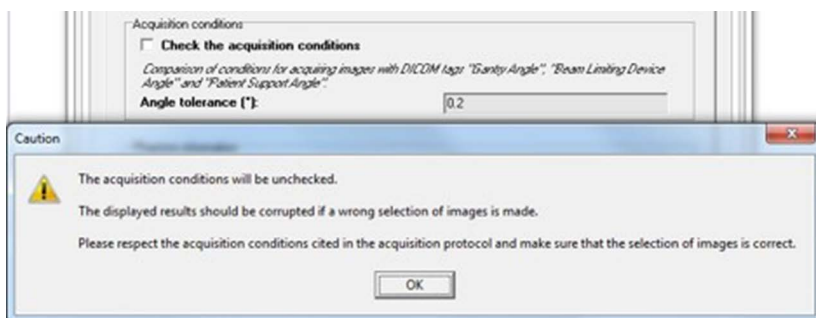


Figure 3-7. Message acknowledging that angles specified in DICOM header for Gantry Angle, Beam Limiting Device, and Patient Support Angle are not selected.

## Phantom information

- **Central marker type:** Depending on the phantom's version, specify the central marker type used by selecting either "Air cavity" or "Ceramic marker."
- **Phantom serial number:** Specify the serial number of the phantom used for testing.

## Acquisition Sequences

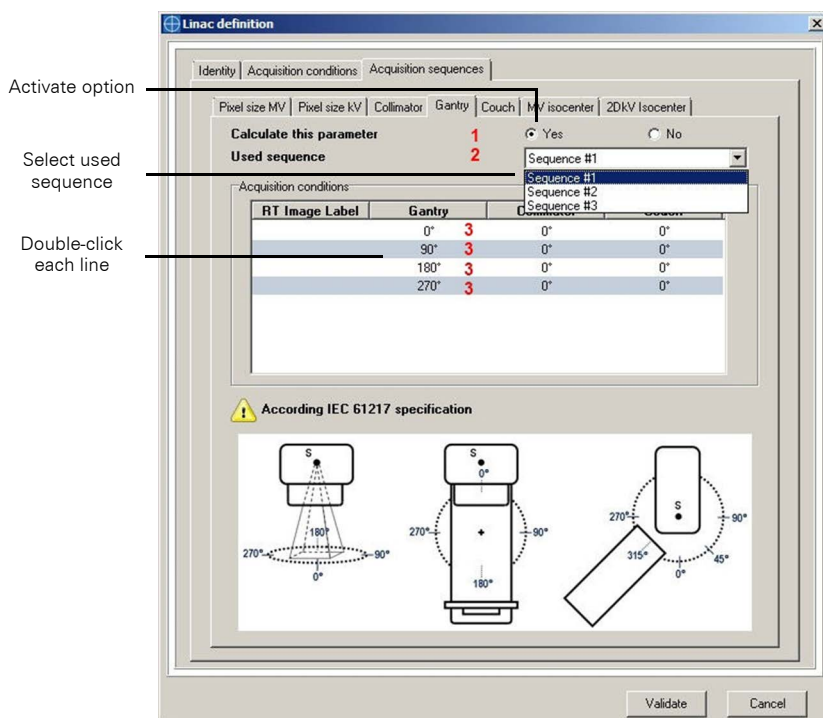


Figure 3-8. Linac Definition Dialog, Acquisition Sequences Tab



To configure each parameter, there are two options: compute or do not compute.

**1** Compute the parameter:

- a.** Activate the Calculate this parameter option.
- b.** Select the used acquisition sequence (except for the Pixel size MV/kV and the 2DKV Isocenter parameters)
- c.** For each image, double-click each line to specify.

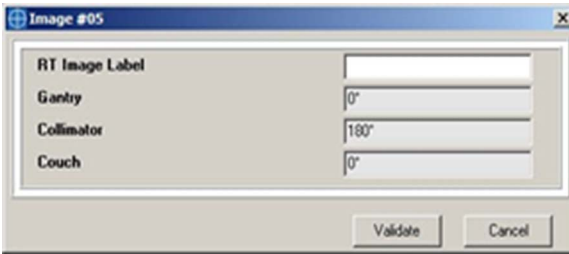


Figure 3-9. Specify RT Image Label for each image (if RT Image Label chosen in Acquisition conditions)



**Note:** Before activating this option, be sure that these values are encoded in the DICOM header.

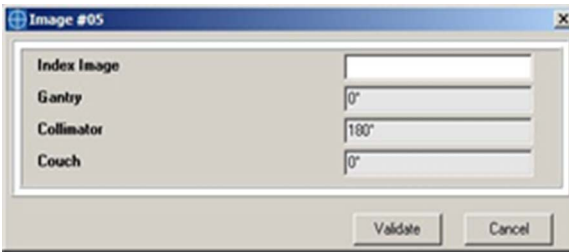


Figure 3-10. Specify Index Image for each image (if Acquisition order chosen in Acquisition conditions)

**2** Compute without the parameter:

- a.** Deselect the Calculate this parameter option.



**Note:** Sequence #2 of the Gantry = Sequence #1 of the MV Isocenter. Sequence #3 of the Gantry = Sequence #2 of the MV Isocenter. Therefore, it is only necessary to acquire the considered sequence once. These images can be used for both parameters.

## Reconfigure Linac

---

The user can reconfigure each added linac by selecting the linac in the Linac Management Menu as shown below. This will open the Linac definition dialog.

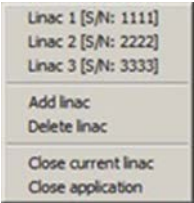


Figure 3-11. Linac Management Menu

## Delete Linac

---

To delete a linac:

- Open the Linac deletion dialog (see Figure 3-12).
- Select the linac that you want to delete.
- Validate.

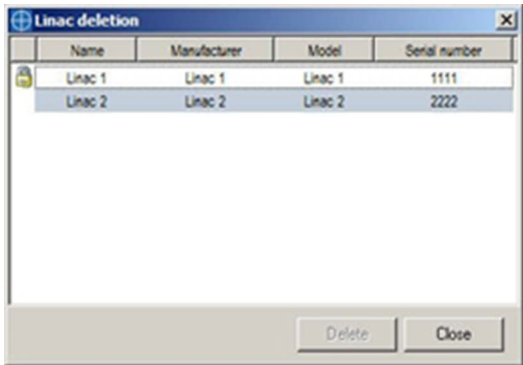



Figure 3-12. Linac Deletion Dialog

The  icon shows that the associated linac is already selected. A selected linac cannot be deleted (see error message in Figure 3-13).

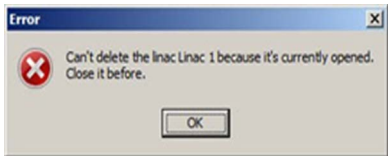


Figure 3-13. Message error shown when deleting selected linac

## Close Current Linac

---

This option closes the current linac. After this action is executed, no image can be analyzed. Select a linac to analyze images.



**Note:** *The user must generate a report before closing the current linac to keep a record of the results.*

## Close Application

---

This action closes the application.



**Note:** *The user must generate a report before closing the current linac to keep a record of the results.*

## 4 Options

There are two configurations in the menu options shown in Figure 4-1.



Figure 4-1. Options Dialog

- **Import directory:** This option allows the user to define the image import directory.
  - To define a directory, click 📁.
  - To delete the defined directory, click ✖.
- **Personalized logo for report:** This option allows the user to choose a personal logo which will be displayed in the header of control reports.
  - To define a personal logo, click 📁.
  - To delete a defined logo, click ✖.

(In this case, the CIRS logo will be displayed by default.)

# 5 Main Interface

Once the user has opened the ISO Analyze Software, it offers a single interface for managing all the functionalities as shown in Figure 5-1.

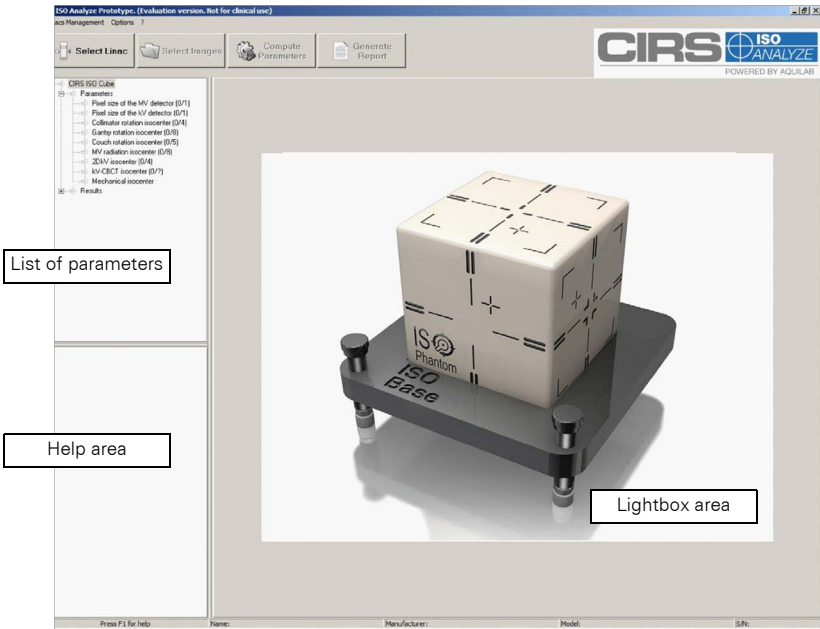


Figure 5-1. Main Window

- The upper section of the interface gives access to the various functionalities of the software via a series of menus.
- The lower section contains a text field describing the currently opened study. If no images have been loaded, the field (with Filename, Device, etc) will be empty.
- The central section of the interface is split into three areas:
  - Top left: This area is dedicated to parameters and contains the list of parameters and the results computed for the current images. If there is no loaded image, the results area is empty.
  - Bottom left: This is the help area containing information about the current image and the main image acquisition parameters. If there is no loaded image, the area is empty.
  - Right: Current images are displayed in this lightbox area. If there is no loaded image, the area is empty.

## Lightbox Functionalities

---

Right-clicking on a lightbox image will open the menu displayed in Figure 25.

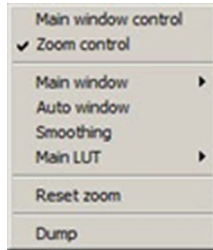


Figure 5-2. Lightbox Functionalities

### Main Window Control/Zoom Control

The control choice determines whether the right button of the mouse is used for controlling the visualization window or the zoom.

#### Main window control

When the Main Window Control mode is active, right-click while dragging the mouse over the view. If the mouse moves from bottom to top, the window center value is modified proportionate to the mouse movement. If the mouse moves from left to right, the visualization window width is modified proportionate to the movement of the mouse.

#### Zoom control

- When the Zoom Control mode is active, right-click while dragging the mouse over the view. If the mouse moves from bottom to top, the image is enlarged in real time, proportionate to the movement of the mouse. If the mouse moves from top to bottom, the image is reduced in real time, proportionate to the movement of the mouse.
- To control the Pan mode (movement within the image), press both buttons of the mouse at the same time or press the left mouse button and the Spacebar while dragging the mouse. The image is moved in real time in conjunction with the movement of mouse.
- The Zoom and Pan apply to the entire series; the values remain unchanged during movement through the series of images.

It is also possible to select one or the other mode by clicking the buttons provided for this purpose on the left side of the lightbox as indicated in Figure 5-3.



Figure 5-3. Control Mode Shortcuts

## Main Window

Selecting the Manual option from the Main window menu item opens the Window adjustment dialog as shown in Figure 5-4.

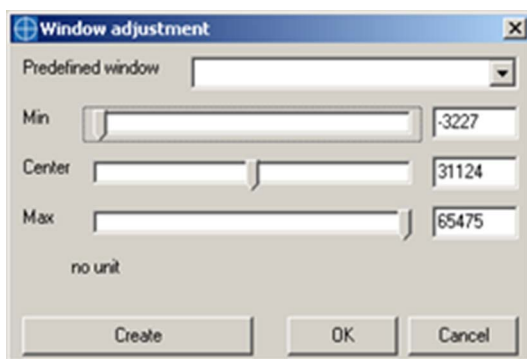


Figure 5-4. Window Adjustment Dialog

- **Predefined window:** This is used to select a predefined display window from the proposed list. By default, this list is empty.
- **Min:** Moving the cursor with the mouse allows interactive adjustment of the minimum visualization window value.
- **Center:** Moving the cursor with the mouse allows interactive adjustment of the central visualization window value.
- **Max:** Moving the cursor with the mouse allows interactive adjustment of the maximum visualization window value.
- To make adjustments to the lightbox images, click the **OK** button.
- Click the **Cancel** button to close the window without making any modifications.

- Create a predefined window. Click the **Create** button to open the backup window as shown in Figure 5-5. Then fill in the field and click **OK** to validate the creation of the new window.

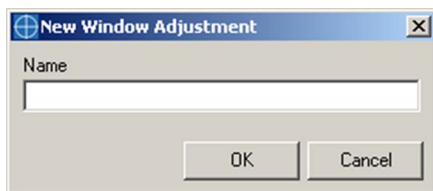


Figure 5-5. Window Creation Window

- If a predefined window is already loaded, save the modifications by clicking the **Replace** button.

**Note:**



- Clicking the **Cancel** button will stop the current procedure and trigger a return to the previous window.
- When saving a specific window, the saved values remain active for the current session.

## Auto Window

The Auto window option applies the visualization window coming from the DICOM file of the selected image if these parameters are present. If the parameters are absent, the window is registered to between the minimum and maximum pixel values contained in the image.



**Note:** The Auto Window mode is selected by default when the images are loaded.

## Smoothing

Smoothing in the lightbox is obtained by selecting Smoothing from the lightbox menu. Smoothing aids in the elimination of the pixelization effect as displayed in Figure 5-6.



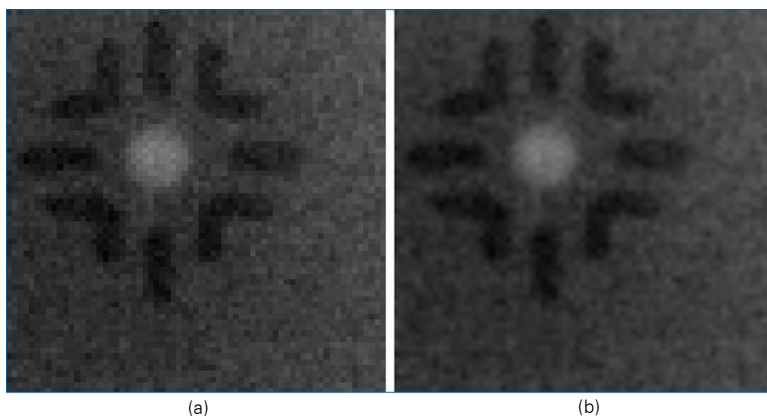


Figure 5-6. Lightbox view a) without smoothing and b) with smoothing

**Note:**



- Smoothing activation applies to all images loaded.
- It is always possible to activate or deactivate the smoothing.
- Smoothing only applies to the display of the images and will not influence calculations.

## Modification of LUT (Main LUT)

This option is used for applying predefined Look Up Table elements to the current view. The various tables available are indicated in the list.

## Reset zoom

The Reset zoom option resets the zoom in all the images of the lightbox depending on the selected option.

## Dump

The Dump option displays the interface in Figure 5-7 which gathers the information contained in the DICOM header of the selected image.

Tag	Title	Value
(0002,0000)	Group Length	192
(0002,0001)	File Meta Information Version	0 1
(0002,0002)	Media Storage SOP Class UID	1.2.840.10008.5.1.4.1.1.481.1
(0002,0003)	Media Storage SOP Instance UID	1.2.840.423832.131794.1309975958.8
(0002,0010)	Transfer Syntax UID	1.2.840.10008.1.2.1
(0002,0012)	Implementation Class UID	1.2.250.1.59.3.0.3.5.3
(0002,0013)	Implementation Version Name	ETIAM_DCMTK_353
(0002,0016)	Source Application Entity Title	Synergy2
(0008,0008)	Image Type	ORIGINAL/PRIMARY/PORTAL
(0008,0012)	Instance Creation Date	20110706
(0008,0013)	Instance Creation Time	201324.656000
(0008,0014)	Instance Creator UID	1.3.46.423832.131794
(0008,0016)	SOP Class UID	1.2.840.10008.5.1.4.1.1.481.1
(0008,0018)	SOP Instance UID	1.3.46.423832.131794.1309975958.8
(0008,0020)	Study Date	20110706
(0008,0022)	Acquisition Date	20110706
(0008,0023)	Content Date	20110706
(0008,0030)	Study Time	201059
(0008,0032)	Acquisition Time	201059.609000
(0008,0033)	Content Time	201059.609000
(0008,0050)	Accession Number	---
(0008,0060)	Modality	RTIMAGE
(0008,0064)	Conversion Type	---
(0008,0070)	Manufacturer	ELEKTA
(0008,0090)	Referring Physician's Name	AAAA
(0008,1010)	Station Name	Synergy2
(0008,1070)	Operator's Name	---

Figure 5-7. Main “Dump” Interface

The information supplied in the standard display mode comprises the TAG, title, and value of the various non-proprietary DICOM field details in the image.

There are several information display modes which can be selected from the menu shown below.

Display all information  
 Display private attributes  
 Display full value  


---

 Print  


---

 Close

Figure 5-8. “Dump” Menu

- The display of all information gives access, for each field, to the VR type and size, in addition to the previously mentioned default fields.
- The display of private attributes gives access to the proprietary fields that are potentially loaded into the DICOM image.
- The display of full value provides access to the entire value, that is, without the truncation of the field.
- Any combination of the first three items can be selected simultaneously. The next two items on the menu are used for printing the Dump and exiting the interface.

## 6 Image Analysis

Select a linac by clicking the **Select Linac** button and choosing the linac in the Linac selection dialog shown below. If no linac is available, see *Add Linac* on page 13.

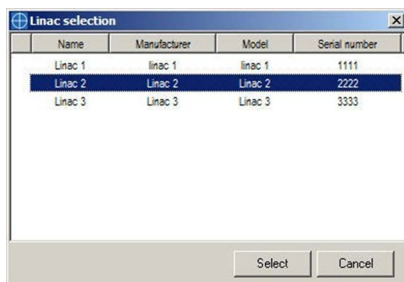


Figure 6-1. Linac Selection Dialog

If another linac is already opened, the dialog shown below will be displayed.

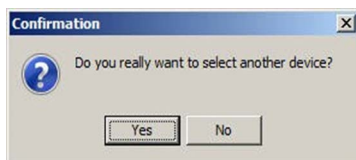





Figure 6-2. Confirmation to select another device


- Select your images by clicking  in two ways:
  -  **By Directory** : Select the directory where images to analyze are stored.
  -  **By Images** : Select the directory where images to analyze are stored. This option allows individual image selection.

---

### WARNING:



- **Before selecting your images, ensure that your linac is correctly configured (see *Acquisition Conditions* on page 14).**
  - **When selecting your images, ensure that they belong to the selected linac.**
- 

- Click  . The selected parameters will be automatically computed.

# Results Window

When results have been computed, they are displayed as shown in Figure 6-3. The parameters computed by ISO Analyze are given with a precision from 2 to 4 decimal places.

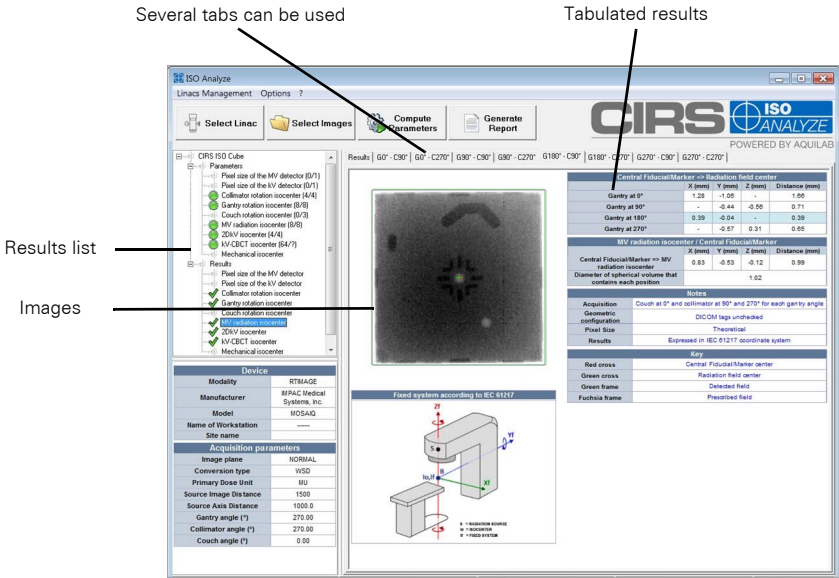


Figure 6-3. Results Window

## List of Results

The list of results refers back to the list of parameters.

The parameters for which computation has been performed are marked with the following icons:

- : Computation took place normally.
- : Computation did not take place normally (generally occurring when an image selection is not appropriate).

The results of a parameter can be displayed by clicking its name in the results list. If this parameter is marked by a red icon, clicking its name will cause a return to the image selection in the main interface.

## Tabulated Results

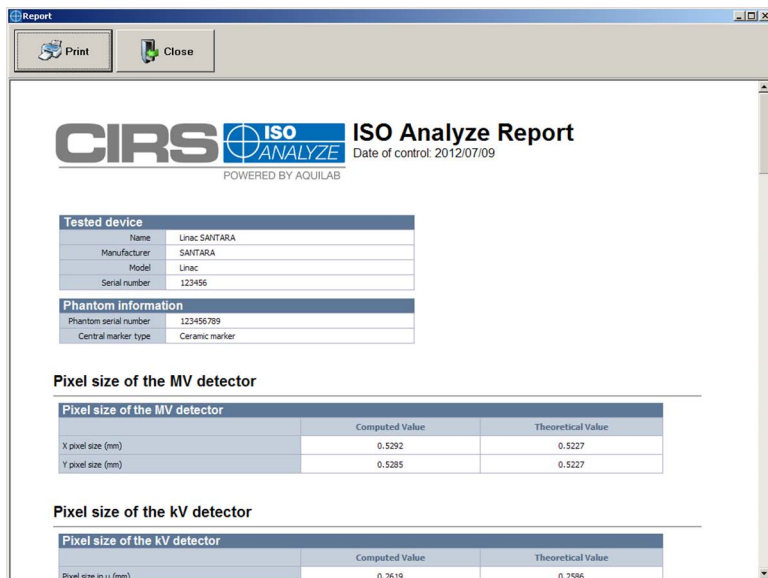
Each parameter is characterized by a given number of elements. These elements are computed from the selected images, and the values obtained are displayed in a tabular format.

## 7 Report

After computing parameters, you can generate a report by clicking



. This will display a report as shown below.

A screenshot of a software window titled "Report". It contains a "Print" button and a "Close" button. The main content area displays the "ISO Analyze Report" with the CIRS logo and "POWERED BY AQUILAB". It includes a "Tested device" table with fields for Name, Manufacturer, Model, and Serial number. Below that is a "Phantom information" table with fields for Phantom serial number and Central marker type. The report also shows "Pixel size of the MV detector" and "Pixel size of the kV detector" tables, each with columns for Computed Value and Theoretical Value.

Tested device		
Name	Linac SANTARA	
Manufacturer	SANTARA	
Model	Linac	
Serial number	123456	

Phantom information	
Phantom serial number	123456789
Central marker type	Ceramic marker

Pixel size of the MV detector		
	Computed Value	Theoretical Value
X pixel size (mm)	0.5292	0.5227
Y pixel size (mm)	0.5385	0.5227

Pixel size of the kV detector		
	Computed Value	Theoretical Value
Pixel size in u (mm)	0.2619	0.2586

Figure 7-1. Typical Report



**Note:** All the distances presented in the report are calculated using the "Theoretical Value" of Pixel size for both the MV and kV detectors. The user can see and assess the impact of the "Computed Value" of Pixel size on these distances by multiplying them with the ratio between the "Computed Value" to "Theoretical Value."

The report can be printed on any previously configured physical or virtual printer on the workstation by clicking the **Print** button. The values are grouped by parameters in a tabular format. Click the **Close** button to close the report.



**Note:** The "Date of control" displayed on the report corresponds to the acquisition date of the oldest image analyzed in the control.

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# 8 Support and Maintenance

## Maintaining Software

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For assistance with software installation and maintenance, contact Sun Nuclear Support.

## Contacting Sun Nuclear Support

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You may request support in two ways:

- Submit a support request using our online form. See *Support Website* below.
- Contact the Sun Nuclear Support team by telephone:
  - U.S.A.: +1 321-259-6862, Option 3
  - Netherlands: +31 20 399 90 41, Option 1
  - Germany: +49 61 02 50 49 500, Option 2

## Support Website

- 1 Open an internet browser and navigate to [sunnuclear.com/support](http://sunnuclear.com/support).
- 2 Enter your email address and password and then click **Login**.
  - To download product information, click **Products and Devices**, select the product, and then select the download type.
  - To open a Support request, click **Open New Case**, complete the form, and then click **Create Case**.

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# Appendix A: Regulatory Supplement

## Sun Nuclear Corporation Symbols

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The following symbols are used in this guide and in Sun Nuclear Corporation's product labels.



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**WARNING:** This symbol indicates a hazard that could result in major injury or equipment damage. (EN ISO 7010, W001)

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**CAUTION:** This symbol indicates a potential hazard that could result in minor injury or equipment damage. (EN ISO 15223-1, 5.4.4)

---



---

**CAUTION:** This symbol indicates a pinch hazard. (EN ISO 7010, W024)

---



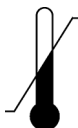
**Note:** Important or supporting information.



Manufacturer's Identification (name and address). (EN ISO 15223-1, 5.1.1)



Date of Manufacture. (EN ISO 15223-1, 5.1.3)



Temperature limitation. (EN ISO 15223-1, 5.3.7)



Humidity limitation. (EN ISO 15223-1, 5.3.8)



Atmospheric pressure limitation. (EN ISO 15223-1, 5.3.9)



*Serial Number. (EN ISO 15223-1, 5.1.7)*



*Catalog Number. (EN ISO 15223-1, 5.1.6)*



*Consult instructions for use. This equipment must be used in accordance with the instructions in this manual. Read all instructions and safety labels before use. (EN ISO 15223-1, 5.4.3)*



*Do not throw in trash; dispose of in an environmentally friendly way. (EN 50419)*

## **Operator Responsibility**

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The instructions in this manual are intended for trained clinical personnel. The operator is solely responsible for the accurate setup and use of the device.

## **Reporting Health or Safety Related Issues or Concerns**

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Any serious incident that has occurred in relation to the device should be reported to the manufacturer and the competent authority of the Member State in which the user and/or patient is established.

To report any safety or health related issues or concerns regarding the use of Sun Nuclear products, contact Sun Nuclear directly.

## **Modifications to Equipment**

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Any changes or modifications to the device that are not expressly approved by Sun Nuclear Corporation could void your warranty.



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